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The Bleak Future of Undersea Warfare

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of Gravelly Naval Research Group.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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Contents

<u>Changing Doctrine</u>	6
<u>Strategic Level</u>	6
<u>Operational Level</u>	10
<u>Tactical Level</u>	15
<u>Increasing Capabilities</u>	18
<u>Conclusion</u>	24

Abstract

The undersea warfare community is at a crossroads. Potential adversaries China and Russia have rapidly increased their capabilities in the undersea domain while the U.S. has remained relatively stagnant. The U.S. needs to change the way that it approaches operations in this domain or risk losing our once significant advantage. One key to accomplishing this change is an application of a Distributed Lethality concept across all domains, including the undersea domain. This is imperative for the Navy to succeed in future conflicts. The undersea warfare community must also address the rapid development and implementation of new technologies and weapons. Without these advancements, submarines will have a minimal affect in the distributed maritime operations strategy.

Introduction

The collapse of the Soviet Union 25 years ago, ushered in an historic period for the United States Navy of unchallenged maritime dominance never before seen. No nation in the world could match our technology on and under the high seas. During this period the U.S. Navy reduced its forces commensurate to the perceived reduced global threats. There has also been a strategic shift from countering a singular threat from the Soviet navy, to the objective of carrier based power projection in any region in the world where control of the sea is never in doubt. The primary role of nearly all U.S. naval ships is to defend aircraft carriers while they carry out their missions. Over the last 25 years, the U.S. Navy has become a defensive oriented force.

The U.S. submarine force has also shifted its strategic focus. It no longer concentrates on countering Soviet submarine threats, but on peace-time roles such as Intelligence, Surveillance, and Reconnaissance (ISR), and strike. This defensive mindset has influenced everything from the development of platforms and weapon systems to doctrine and training. This shift in focus has caused our forces to atrophy. Our narrow view has prevented us from preparing our forces for the future battle-space.

The U.S. Navy no longer enjoys an asymmetric advantage in the undersea domain. There are many military leaders, scholars, and industry experts that feel that the U.S. can still dominate the subsurface battlespace due to our technological superiority and immense advantage in resources. These benefits put our forces in a preferable position, however, our adversaries are finding new ways to close gaps in capabilities and neutralize others with new and emerging technology and weapons.

The U.S. submarine force must swiftly adjust to the current global threat environment or risk continued degradation of its once asymmetric advantage in the undersea domain. This radical course correction is required in two specific areas: force strategic and operational development as well as associated force wide training to a warfighter first mentality; and the development and rapid implementation of new and emerging technologies in sensors, weapons and communications equipment.

The echo chamber of strategic thinkers and military leaders have developed many plans for conflicts with potential adversaries. In most cases, they shy away from worst case scenarios, tend to overestimate U.S. capabilities and underestimate those of the enemy. While they convince themselves that they are being realistic, arguably they are doing a disservice to our forces by failing to be honest with our potential shortcomings.

Consider the following brief counter argument. Understand that this in no way reflects U.S. operational plans or strategies. This is a purely fictional depiction of a scenario that could play out in the near future.

The year is 2017, and the waters of the South China Sea (SCS) are growing increasingly active. The PLAN is conducting maritime patrols near their claimed islands in the SCS. The U.S. Navy is increasing the number of freedom of navigation missions in the SCS.

There are significant uprisings on Taiwan from the communist insurgents. These demonstrations are dispersed by the Nationalist government and police. The PRC denounces the actions by Taiwan calling for an end to the violence. It is believed that the uprisings are being

caused by PLA special forces that have infiltrated Taiwan. Rhetoric from Taiwan is publicly denouncing the “One China” policy of the U.S. and PRC and calling for independence.

The U.S. observes significant increases in troop concentrations of PLA troops near the Taiwan Straits. The PRC issues a public statement that if the Taiwanese people do not cease and desist all diplomatic communications with the U.S., the PRC will be required to forcefully reunify the island with the mainland to stop the looming rebellion and protect the Chinese citizens on the island. They also assert that this is a domestic dispute and that any outside intervention on behalf of Taiwan, will be an act of war. All allied forces within the region will be considered hostile and enemies of the PRC if actions are taken to support Taiwan.

Following these statements, China formally declares the extension of its Air Defense Identification Zone (ADIZ) to include all of Taiwanese air space and the 9 dash-line waters of the SCS that the PRC claims as its territorial waters. The U.S., citing international law, does not recognize these claims and continues FON operations in the SCS.

The PLAN conducts amphibious training exercises and significantly increases the number of submarines underway. The PLAN aircraft carrier and a supporting group of surface combatants begin conducting flight operations near the Taiwan Strait.

The U.S. attempts to reduce tensions through diplomatic channels but is unsuccessful. The PRC insists that the U.S. is continuing to communicate with and provide military assistance to Taiwan further inspiring of the revolt. The PRC withdraws all diplomats from the U.S. and its allies in the region.

The U.S. withdraws all its naval forces outside of the second island chain to prevent provoking a response from the PLAN. The PLA launches an attack on Taiwan using aircraft and missiles from the mainland. The attack devastates Taiwan’s defenses. The Taiwanese naval

ships are destroyed or disabled in the first day of the attack. Taiwan's air defenses including most of their aircraft are destroyed by the end of the second day of the conflict.

Taiwan formally requests U.S. and Japan to aid in the defense of the island. The U.N. issues no resolutions due to a veto by Russia and China. The U.S. formally declares war on China and states that a coalition of NATO allies and other allies from the region including Japan, Philippines, and Australia will defend the island of Taiwan from the unprovoked and malicious attack by the PRC.

Within one hour of the formal declaration from the U.S. and its coalition, the PLA launches an attack on all U.S. bases in Japan and the Philippines using cruise and ballistic missiles from the mainland and from ships and aircraft in the East China Sea ECS and SCS. This attack is partially stopped by U.S. defenses; however, it significantly reduces the capability of most air and naval bases in the region. The U.S. begins to relocate its forces to bases in Australia, outside the range of the PLA missiles.

During the first stages of the conflict, the PLA also attacks and destroys most the U.S. GPS and communications satellites. This leaves all ships and aircraft without the ability to conduct precision navigation and timing (PNT) for over the horizon (OTH) weapons targeting.

The coalition forces are aware that the PLAN is preparing to conduct an amphibious assault on Taiwan. The allied commander plans to send submarine forces into the theater to commence a multi-faceted attack. First, SSK's from Japan and Australia will supplement the U.S. SSNs in the Taiwan Strait to attack and sink as many PLAN amphibious ships as possible to prevent the amphibious landing. The remaining U.S. SSNs will be divided into two groups. The first will be assigned probable enemy SSN and SSK operating areas and locate and destroy as many submarines as possible. The second group will be assigned waters near PLAN naval bases

with orders to locate and destroy as many surface assets as possible. With the lack of communications and GPS, the orders to the submarine commanders must be clear and require little to no follow-on guidance. Mission command will be essential to the success of their tasking.

The PLAN has prepared for the initial submarine offensive. It has secretly laid significant mine fields in all expected choke points that are commonly used by the submarine force. This results in the loss of many U.S. and allied submarines. The Chinese have also staged many of their SSKs in areas and silently lie in wait for enemy submarines to pass by before engaging with torpedoes. The PLAN also employ vast networks of airborne ASW aircraft and sensors to locate and destroy any potential submerged threats.

The lack of communications capability and poor navigation accuracy, leads to confusion and inability for coordinated efforts from the Allies. When coupled with the significant defensive PLAN ASW efforts, the losses to the are significant and the PLAN can land and execute an amphibious assault on Taiwan with little to no interference from the submarine threat.

This scenario raises some pertinent questions that need to be addressed. It is possible for the U.S. submarine force to be rendered relatively impotent when facing a comparable threat. It is also possible that we overestimate the lethality of our capabilities in a wartime environment. This overestimation must be addressed and corrected. Both problems can be related to the doctrine and capabilities possessed by the submarine force.

Changing Doctrine

The first area that must be addressed is *how* Undersea Warfare (USW) is carried out. For too long our uncontested mindset has led to old ideas and strategies becoming stagnant doctrine that is outdated and ineffective. This mentality must be addressed at all levels of operations for the change to be effective. At the strategic level, Commander Submarine Forces (SUBFOR) can align the submarine force with the rest of the Navy with a new offensive and lethal mindset. At the operational level, squadrons can shift the focus to combined operations in wartime scenarios. And at the tactical level, submarine commanders can better learn to fight the ship and focus on achieving a warfighter mentality.

Strategic Level

Without specific guidance from the highest levels of naval leadership, the USW community will not change course. There is no perceived threat to the U.S. Navy submarine force. However, if no action is taken to prepare for conflict, there is a significant risk to our force from an adversary who has studied our platforms and methods and is prepared to take advantage of our weaknesses. If we do not rapidly evolve into a warfighting power, the results in a war would be disastrous.

A new strategy has emerged from the Surface Warfare community. Distributed Lethality (DL) is the brainchild of VADM Rowden and is a complete paradigm shift from the mindset of force projection that the Navy has been practicing for the past 25 years.¹ During the Cold War, the U.S. was locked in an arms race with the Soviet Union. We developed platforms and weapons designed to combat the Soviets in combat operations. Our navy focused on producing large numbers of highly capable warships to match those produced by the Soviets. Our naval strategy focused on potential blue water conflicts with our ships and submarines pitted against comparable platforms. When the Soviet Union collapsed in the early 1990's, their armed forces and their navy were effectively abandoned. The U.S. was left with no navy in the world that could challenge its supremacy on the open seas or in the littorals. We had achieved total sea control without firing a single shot. During the years that followed, the navy shifted its primary strategy from achieving sea control, to projecting force using its aircraft carriers. All naval platforms were specialized to provide defense for the carriers. Over the past 10 years, the world has witnessed the resurgence of Russia and the rise of China as a military power. Both countries are producing large numbers of highly capable platforms and weapons. The presence of these two near peer competitors has challenged our ability to claim total sea control and has produced environments that our presence can be contested. The impetus for the new DL strategy is that the U.S. Navy must be able to obtain and maintain sea control in these contested environments. This requires warships to increase their *offensive* capabilities and operate separate from the Carrier Strike Group (CSG) to distribute the potential threats posed to an enemy.

This new strategy needs to be adopted by the whole navy including the USW community. Distributed Maritime Operations (DMO) creates substantially more capabilities for distribution

¹ Vice Admiral Thomas Rowden, Rear Admiral Peter Gumataotao, Rear Admiral Peter Fanta, "Distributed Lethality" *U.S. Naval Institute: Proceedings*, Vol. 141/1/1343, January 2015:1

of these offensive capabilities across all domains. From air, surface, and subsurface platforms, more weapons can be brought to bear against rivals. While the navy does conduct some operations across domains, this is not a capability that we excel at. Each arm of the navy tends to operate mostly by itself. There is little coordination between air, surface, and subsurface forces. What coordination does occur, is normally limited to minor operations or small scale exercises. For a DMO strategy to be successful, there must be seamless integration between these domains. Targeting information must be shared, decision making processes must be coordinated, and weapons distribution must be deconflicted. This will require guidance from the highest levels of the navy to ensure these aspects of the new DMO strategy are in lock-step.

CSF stresses the need for a *warfighter mentality* in his Commanders Intent.² This is one aspect that began to atrophy at the end of WWII. There are two significant factors that have caused this. First, with no comparable adversary for the past 30 years, the submarine force has shifted away from an offensive mentality to a defensive mentality. Second, is the advent of nuclear power and its all-encompassing nature, it has distracted the submarine force from being a warfighting force.

The submarine community has stopped thinking in a way designed to win battles at sea and instead focuses on peacetime operations, similar to the findings of ADM Rowden within the surface community. For the submarine community to fix this problem, it first must accept that it has a problem. If there is no casualty or crisis, there is little motivation for self-assessment. The submarine force has been able to effectively carry out the missions assigned to it for the past 70 years with relative ease. However, when and if that mission changes to one that involves undersea combat operations, the submarine force will be woefully unprepared just as it was at the

² Vice Adm. Joseph Tofalo, Commander's Intent for the United States Submarine Force and Supporting Organizations, 11 Dec 2015: 8

beginning of WWII. To cause a shift in the entire forces mentality, CSF needs to address this from a strategic level. While the commander's guidance issued by CSF does list "Warfighting" as one of four purposes of U.S. Submarine Forces, it is listed last as "*Finally*, if necessary, we use our undersea advantage to strike targets, conduct theater and unit-level anti-submarine warfare (ASW) and anti-surface warfare (ASUW), and perform other warfighting missions across multiple domains."³ However, throughout this guidance, there is little mention of how to properly prepare for "Warfighting". It is *assumed* that our force can properly carry out that mission. Strategic guidance is necessary to focus our entire community on increasing our offensive warfighting capabilities.

With the launch of the USS Nautilus at 11:00 AM on 17 Jan 1955,⁴ the Submarine community would never be the same. Submarine crews are devoted to operating and maintaining the nuclear power plant that propels them through the depths. All the officers and nearly half of the crew are highly trained nuclear operators. The dedication to this singular aspect of a submarine is a necessary evil to ensure the safety of the nuclear reactor. However, this dedication has become a significant burden to the warfighting capabilities of the submarine force. Countless hours are spent training, learning and relearning specifications and concepts, planning for, performing, and properly documenting maintenance, preparing for and conducting inspections, and coordinating and conducting availabilities with shore facilities. These activities absorb nearly all the available bandwidth for a submarine crew. There is little time or resources available for training and preparing the crew for a warfighting mission. Learning how to fight the ship becomes a secondary focus. The primary mission is lost in the minutia of administration

³ Vice Adm. Joseph Tofalo, Commander's Intent for the United States Submarine Force and Supporting Organizations, 11 Dec 2015: 8

⁴ History of USS Nautilus (SSN 571), <http://www.ussnautilus.org/nautilus/index.shtml?museumNautilus>

and maintenance of the nuclear power plant. While the submarine force expends significant resources training its Commanding Officers (COs) and Executive Officers (XOs) during the Submarine Command Course (SCC), the remaining crew are left trying to balance the required day-to-day operations with the need to become warfighters first and learning to effectively fight the ship. From a strategic perspective, it is imperative that the submarine force recognizes that there is a competition between maintaining a highly proficient nuclear force, and a highly skilled warfighting force. Right now, the nuclear aspect is sapping valuable resources in manpower and bandwidth from its officers and crew and preventing these crews from fulfilling their responsibilities of being warfighters first. To cause a shift in the underlying structure of day to day operations, CSF can re-align the submarine force and refocus it towards a warfighting mentality.

Operational Level

The submarine force has always operated “alone, and unafraid.” This has been a necessity due to the desired stealth of the platform. Operating while maintaining continuous communications or conducting coordinated operations with other units, requires submarines be exposed to a higher risk of detection. Most submarine operations are performed allowing a significant amount of flexibility to the submarine CO in the completion of his mission. While this has been the normal mode of operations in the past, future contested environments may require a new and unusual way of employing the submarine force.

For the submarine force to be effectively utilized in a Distributed Maritime Operations (DMO) strategy, it may require significant changes in traditional submarine missions. For a submarine to contribute in a distributed concept, it must have three things: first, a new and

innovative command and control (C2) structure; second, the ability (not the necessity) to communicate across all platforms; and third, effective and highly detailed mission plans and contingency plans.

The need for a new C2 structure is brought about by the integration across all domains with a focus on mission command as a primary tenant. The guidance from the CNO from his Design for Maintaining Maritime Superiority, he states the significant importance of the need “to prepare for decentralized operations, guided by commander's intent.”⁵ For an effective naval strategy to be employed, it must have a well-defined and effective C2 structure. Using a DMO concept will require seamless integration of sensors, platforms, and weapons systems. The difficulty in producing a C2 structure for DMO stems from the lack of experience working between all three areas of naval warfare. Air warfare C2 is specialized for air warfare, surface warfare, and subsurface warfare are likewise specialized. Ensuring that all platforms are utilized most effectively will be a high priority. For this to be the most efficient process, effective communications are a must.

Communications across all domains is an essential leg of the DMO concept. The ability to operate without communications is also a necessity. Certain operations will require high level command decisions to be distributed to units. Sharing of sensor data will allow for an integrated battle-space picture to be developed. Coordination of weapons employment will maximize effective use of all available weapons.

In a contested environment, communications will be a detection risk. Our adversaries can potentially detect and track emissions from our aircraft and warships used for communications. These adversaries also have highly capable weapons that can hold our

⁵ John, M. Richardson, A Design for Maintaining Maritime Superiority, Naval War College Review 69, no. 2 (Spring, 2016): 11-18, <https://search.proquest.com/docview/1786538439?accountid=322>

platforms at risk of attack at great distances from their shores. This will cause us to find ways to communicate that offer lower risk of detection or conduct operations in a passive receive only mode which will make location of our platforms by enemy sensors less likely. One technology that will could possibly facilitate communicating in a high threat environment are called Low Probability of Intercept/Low Probability of Detection (LPI/LPD) communications.⁶ While these aren't guaranteed to be undetectable, they do provide a commander with a means to reduce the likelihood of being detected if communications are required. These LPI/LPD communications would make communications with submarines less of a threat to their stealthy posture.

Communications also need to be analyzed for their ability to talk across multiple networks and between multiple platforms. Seamless integration of all the sensor data from aircraft, ships, submarines, and unmanned systems is critical to the success of a DMO strategy. We have many different weapons systems, radars, sonars, and electronic warfare systems that are not able to share information. There are certain platforms that are unable to electronically pass information from certain sensors into the fire control system to develop a target solution. This must be addressed to create a single communication network that is globally accessible to all navy platforms. This network would provide all U.S. Navy platforms with a current operational picture of the battlespace based on the inputs of all sensors on all the ships and aircraft. If submarines could passively tap into this network and receive updated information on targets outside of the ships organic sensor range, it could potentially launch longer range weapons and destroy enemy targets without the need for close range encounters. This would allow submarines to penetrate under an enemy's defenses and strike targets without warning. Without

⁶ Megan Eckstien, *Navy: Future Undersea Warfare Will Have Longer Reach, Operate With Network of Unmanned Vehicles*, USNI News, 24 March 2016

this situational awareness of the battle-space, DMO would be a difficult and potentially hazardous undertaking.

Redundancy in communications is necessary to maintain continuity during combat operations to prevent confusion and potentially loss of the initiative to the enemy. In contested environments, the enemy may have the capability to jam certain communications. The Chinese have also demonstrated the capability to destroy satellites using ground based missiles. Our forces must have capabilities to conduct communications in ways other than by satellite or using the RF spectrum. One potential alternative communication path is the use of pseudo satellites. These are unmanned aerial vehicles that fly high above a portion of the ocean that allows for point to point communications or potentially sea to land communications depending on the payload carried on the pseudo satellite.⁷ These pseudo satellites could provide a means to ensure continuous communications are maintained in a conflict where satellites are at risk. The use of lasers for communications is also a possibility in an RF jammed environment. This technology is a possibility for the future but it would offer a way to communicate that is less detectable and less capable of being jammed.

If the operational situation dictates little to no communications, it is necessary to ensure that detailed and properly prepared battle plans are in place. This is not a skill that is practiced often at the operational level. Most submarine operations are broad and cover few contingencies. The necessity for strict compliance and cooperation with other units is minimal. If coordination is required, it relies on significant levels of communications between the units and the commander shore-side.

⁷*Zephyr, the High Altitude Pseudo-Satellite*, <https://airbusdefenceandspace.com/our-portfolio/military-aircraft/uav/zephyr/>

Submarines can operate for extended times with little to no active communications. The submarine can receive passive communications from the shore commander to provide updates on intelligence and mission status and use a given set of pre-established guidelines to operate by. This would be a possible way for the entire force to operate if operations were required to be strictly passive. A detailed set of operations would be promulgated by the commander prior to sending the ships and aircraft into the battle-space. All units would have specific tasks to complete and areas to operate in. Then all further updates would be transmitted to the fleet using passive methods to prevent detection by the enemy. This could significantly degrade the situational awareness of the commander and the rest of the ships in the fleet due to the lack of shared sensor data. However, if sensors external to the denied battlespace were available, all relevant targeting information could be fed to the fleet passively.

Contingency plans are also an extremely important aspect of the DMO strategy. Due to the high level of coordination required, the potential lack of communications, and the multitude of other potential vulnerabilities, the commander must prepare his forces for contingencies. This is a process of operational risk management at the fleet level. During naval battles in the past, the operations took place over a limited time in a relatively limited area and typically between two domains. Future conflicts will occur over very long spans of time over vast areas and between all domains from the sea-floor to outer space. This vastness of future conflict creates potential risk of failure from many directions. Self-inflicted casualties caused by human error, equipment failures, or poor preparation are always possibilities. And in battle, the enemy will attack at any known weakness. Some may be known weaknesses that are prepared for, others may be unknown weaknesses that catch our forces by surprise. Normal risk management will assess risks and probability and propose a solution to accomplish the mission with the minimum

acceptable risk. DMO risk management must look at all potential risks, and prepare plans to mitigate those risks and train the force on how to execute its mission in the event of a failure.

Tactical Level

The submarine commander has the awesome responsibility of taking the Commanders Intent from CSF and incorporating it into his command philosophy. This command philosophy touches all aspects of readiness for the COs ship. Areas that must be addressed in this philosophy are proper execution of mission command, instilling the warfighter mentality into every member of the crew, placing the proper importance on learning to fight the ship in wartime scenarios, and instilling in all hands the supreme importance of the purpose of the ship as a weapon of war and not as a filing cabinet for administrative documents.

Mission command is defined as “the conduct of military operations through decentralized execution based upon mission-type orders.”⁸ Mission command is necessary for submarines due to the typical nature of their operations in a communication constrained environment. Commanders issue orders focused on the purpose of an operation and not the details of how to accomplish the assigned task. It requires that every level thoroughly understands the intent of the mission order to ensure it is accomplished. Submarine COs must exercise mission command at every opportunity, both up and down the chain of command, to give their crews the opportunity to practice this skill. Mission command is an essential tenant of DMO. As previously stated, a new form of C2 is needed to enable DMO. Mission command must be a central part to the C2 structure of a DMO strategy.

⁸ Gen Martin E. Dempsey, Mission Command White Paper, 3 April 2012

The nuclear mindset of the submarine force is pervasive. Day-to-day operations and maintenance will erode the core of the typical submarine crew. The typical submarine schedule is not conducive to down time. Many sailors become disenchanted due to a lack of motivation to continue doing the hard and underappreciated work that is necessary to keep the ship ready for action. This requires a concentrated and continuous effort to instill in the crew the warfighter mentality. Inspiring sailors is difficult if they see their job as unimportant and mundane. Every attempt must be made to explain why that ship exists, and how being a warfighter is important. Using naval history is an outstanding method of inspiring young sailors. Learning about how WWII submariners fought and died is excellent motivation towards the warfighter mentality.

Becoming proficient at tactically employing the ship is another area that must receive more focus. Typically, the CO and the XO are the only master tacticians and the rest of the crew are merely following procedures and pushing buttons. This paradigm must be altered to build depth in the crew. The whole crew must become not only proficient at delivering ordinance, it must become tactically adept at doing so as well. This ability to fight the ship must be shared by the whole crew and not just the CO and XO. This capability is not learned in a classroom or behind a computer. It must be practiced at sea, over and over. And the practice must be against realistic and capable threats. In the submarine force, very little time is devoted to preparing for battle. Most training is designed to conduct peacetime operations and is defensive in nature. This leads to little to no exposure to training for ASW or ASUW engagements. The submarine force needs to take a dedicated look at how it evaluates tactical proficiency of its crews. If our force must be able to win in an engagement with peer competitors, then we must raise the expectations in our evaluations. Relying on the superior technology and stealth of our submarines will no longer guarantee victory.

One specific aspect of our tactical training and evaluation process that needs to be addressed is how we define a successful engagement. ASW is a low margin for error activity. It is like Air-to-Air combat only slower. Two crew served platforms are pitted against one another and the victor is the one who successfully positions his ship or plane and delivers a warhead properly to destroy the enemy. Examining how the aviation community trains its pilots for combat reveals a stark difference to the way the submarine force trains its crews for combat. The emphasis in the aviation training is on results. Kill or no kill. Then the engagement is scrutinized and the good and bad maneuvers are reviewed, the proper or improper weapons employment are discussed and lessons learned are taken down. For submarine engagements, less attention is paid to the results and more is paid to the processes. The minutia of procedures is scrutinized, the proper application of litanies is verified. Whether the target is destroyed is seemingly lost in the endless discussions about which step of the procedure was misunderstood. There is a necessity for ensuring procedures and formal processes are followed during engagements, this ensures that all the members of the team are carrying out the necessary actions to place a weapon on target. However, teams are so focused on these processes that they are failing to understand what they are doing. This focus on rote memorization is dangerous and creates brittle teams that lack an ability to overcome adversity when unexpected events occur. The primary focus during engagements must be proper positioning of the platform, was it a good shot, and did the weapon hit the target. Kill, or no kill. Results based training will foster a climate that is focused on warfighting first and the processes will fix themselves.

The last area that must be addressed at the command level is the need for resource management. The sailors are the most valuable resource to the submarine CO. Each of these sailors are pulled in every direction during their time onboard the ship. There are normally not

enough hours in the day or days in the week to accomplish all that is required. This produces significant strain on the submarines crew. The CO is tasked with a never-ending list of requirements that the ship must not only accomplish, but do well enough to be certified to operate at sea. This task of resource management is a very difficult battle. The crews time must be allotted to perform maintenance, conduct nuclear training, prepare for the next mission, prepare for the next external inspection, ensure the crew is pursuing qualifications to operate the ship, and the list goes on and on. The aspect that typically gets the most attention is the administrative aspects of maintenance and training. Not the performance of these tasks, but the documentation of them. Countless man-hours are absorbed by properly documenting the maintenance performed and the training conducted. All this is done to ensure that external agencies can monitor the completeness of the documentation. These systems, along with the multitude of other administrative burdens, consume countless resources from the ship. This significantly impacts the amount of bandwidth that the crew can devote to training to employ the ship in battle. The priorities are misaligned. Less emphasis should be placed on documentation of training, and more on results of the training. Kill, or no kill. That is what is important. That is the mission of a warship.

Increasing Capabilities

The USW community has been primarily using its Mk 48 heavyweight torpedo as an offensive ASW and ASUW weapon since its inception in 1972.⁹ There have been incremental changes to the capabilities of the weapon over the years, but it has remained largely unchanged.

⁹ “Mk 48 ADCAP”, *IHS-Jane’s*, DOI 15 May 2015, No article ID

While this torpedo is highly capable when compared to torpedoes fielded by most other nations, it has a relatively limited range which requires the launching submarine to be relatively close to potential threats to engage them. With the resurgence of the Russian navy and the PLANs ever increasing investments in advanced weapons and technology, the Mk 48s perch atop the world as the preeminent submarine launched weapon may soon be over.

The U.S. submarine force has long had an asymmetric advantage in the undersea domain. The quieting technology onboard our submarines was far superior to that possessed by any other nation. Our sensor technology greatly outperformed those fielded by our rivals. We had the ability to remain undetected by our adversaries and could detect their ships and submarines at great distances. This time is however coming to an end. The Russian navy and PLAN have not only been advancing their weapons technology, but their ships and submarines are becoming vastly more capable. In 2017, the Russian navy will launch two more of its newest and most capable submarines.¹⁰ The first to be launched is a Borei-class submarine, a ballistic missile submarine, which has quieting technology that is reportedly comparable to that of the U.S. Virginia class submarine. The second is a Yasen-class which is a guided missile submarine. It also has advanced quieting technology. This will be the fourth Borei-class submarine to enter service and the second Yasen-class. Like the Russians, the Chinese are fielding new submarines as well. The new Type 093B nuclear powered attack submarine has potential quieting technology that is similar to the U.S. improved Los Angeles class submarines.¹¹ These submarines will pose a threat to U.S. submarines in the undersea domain.

¹⁰ Thomas Gibbons-Neff, *Russia readies two of its most advanced submarines for launch in 2017*, 29 December 2016

¹¹ Dave Majumdar, *Why the US Navy Should Fear China's New 093B Nuclear Attack Submarine*, 27 June 2016

It is important to acknowledge that the USW community must not continue to operate with the weapons that have been used for the past 40 years. The capabilities and weapons of the adversary have continued to advance and we must find new ways to regain our asymmetric advantage. Using new technology, the USW community needs to find ways to counter the most probable threats to U.S. submarines. Those threats are, enemy submarines, ASW capable surface warships, ASW aircraft, and mines. CSF has called for the submarine force to “grow longer arms” to ensure that our force can continue to dominate the undersea domain. There are several emerging weapons systems that address these threats.

Long Range Torpedo

The Mk 48 is still a highly capable weapon. However, its effective range of approximately 10 nm¹² forces the submarine to be placed at risk of counter attack once the torpedo is fired. To increase the likelihood of a successful engagement, the range of the heavyweight torpedo needs to be increased. If a torpedo can be fired at a range outside the counter detection range of an enemy submarine, the possibility of a successful counter attack is minimized. The Navy is researching an advanced torpedo propulsion system that could vastly increase the range of a heavyweight torpedo.¹³ This is the first step. The next portion of the torpedo that must be updated would be the guidance and targeting system. Increasing the range of a torpedo poses new challenges when it comes to weapon employment. A submarine normally has organic sensor data on targets that are engaged using torpedoes. This allows the submarine to ensure that the weapon is engaging the proper target. For a submarine to fire a

¹² “Mk 48 ADCAP”, *IHS-Jane's*, DOI 15 May 2015, No article ID

¹³ Michael Fabey, *U.S. Navy Looks to Dramatically Increase Torpedo Range*, *Aerospace Daily & Defense Report* 252, no. 34, May 18, 2015: 5, <https://search.proquest.com/docview/1749631203?accountid=322>

torpedo beyond sensor detection range, it must be able to proceed to a designated probable location and detect and positively identify an enemy target and destroy it. This is a very different form of engagement than is currently employed by submarines and is beyond the sensor capabilities of current torpedoes. However, a similar concept is already used for beyond visual range targeting using cruise missiles. This capability could also be used to launch torpedoes against surface ships as well. Targeting information for both surfaced or submerged contacts could be supplied to the submarine from aircraft, or other surface ships allowing further capabilities to be added to the DMO strategy. This new capability will greatly improve a submarine's lethality in contested environments against near peer adversaries.

Tomahawk Anti-Ship Missile

ASW capable surface warships pose a significant threat to submarines. They can use onboard active and passive sonar to locate and engage submarines, they can also be used to prevent submarines from accessing certain areas due to the risk of detection. These warships also possess the ability to launch ASW helicopters which vastly increase the speed and range at which these platforms can deliver torpedoes to attack submarines.

At this time, the only weapon that U.S. submarines possess to attack surface warships is the Mk 48 torpedo. As previously stated, the range from which this weapon must be fired requires a submarine to be too close to the target. A submarine must have the ability to target and engage surface ships from safe distances.

The tomahawk land attack cruise missile (TLAM) is a weapon that has been used for strike missions for many years. It can be fired from both surface ships and submarines. It was originally designed to be used as an anti-ship missile as well however, its inability to

discriminate targets led to its removal from the fleet in 1994. Now the technology is available to add precision and target discrimination capabilities to the seeker and the Navy is procuring an anti-ship variant for the fleet and is scheduled for delivery in 2012.¹⁴ This added capability will also be a significant increase in the lethality submarines possess.

Anti-Air Missiles

Another significant threat to submarines is the presence of ASW aircraft. A submarine's only defense from being prosecuted by these aircraft is to run or hide. If located, these aircraft carry torpedoes that can quickly be dropped and engage target submarines with devastating results.

There are no systems under development for the use of surface to air missiles launched from U.S. submarines. The Germans have developed a system called the Interactive Defense and Attack System for Submarines (IDAS).¹⁵ This system launches a short-range sub sonic missile from a 21-inch torpedo tube. The weapon is guided to its target using an active seeker and can be wire guided from the submarine. It was primarily designed to defeat ASW helicopters.

The U.S. has many capable anti-air missiles that could be altered into a submarine launched version. The AMRAM, AIM-9, or even one of the Standard Missile variations could potentially be redesigned into a submarine launched variant. The potential benefits for the submarine force are significant. If a submarine was capable of engaging and destroying MPRA and ASW aircraft, enemies would be forced to alter the way they conduct AWS operations. The

¹⁴ Sam LaGrone, *WEST: U.S. Navy Anti-Ship Tomahawk Set for Surface Ships, Subs Starting in 2021*, USNI News, 19 February 2016

¹⁵ *IDAS Submarine Launched Surface to Air Missile System*, 14 February 2012

significant advantage gained due to the long range of aircraft would be removed. This would allow submarines to have more flexibility in operations if not held at risk by aircraft.

A secondary application of anti-air missiles would be their use in a DMO context. Were a submarine able to receive real time targeting data via passive means, it would be able to operate much closer to and engage enemy defensive aircraft in a contested environment beginning the roll back of the Integrated Air Defense System (IADS). This capability would significantly increase the lethality of the submarine force.

Unmanned Systems

The future of undersea warfare will involve the use of unmanned systems. The applications are extremely vast in this arena. There are unmanned aerial vehicles (UAVs) already in use in the submarine force.¹⁶ Unmanned underwater vehicles (UUVs) are being developed and tested in a variety of applications. The potential capabilities for the submarine force are significant. These new platforms could be used as sensors that feed information back to the submarine to aid in location of and targeting enemy platforms. They could also be used as weapons platforms that are used to supplement the limited space available on a submarine. Regardless of how they are employed, the USW community must continue to rapidly develop these new and emerging technologies to help the submarine force regain its advantage in the undersea domain.

¹⁶ Dave Majumdar, *U.S. Navy Launches UAV from a Submarine*, USNI News, 6 December 2013

High Velocity Learning

The CNO has called for the navy to adopt the new concept of high velocity learning in his Design for Maintaining Maritime Superiority.¹⁷ This is a key concept that must be included in the future of the USW community. With the upcoming advent of new weapons systems and the necessary changes to USW doctrine, the submarine force will be forced to rapidly adapt to a new environment focused on a warfighter first mentality. One of the tenants of the CNO's high velocity learning is to expand the use of learning centered technologies such as simulators and gaming. Both could be extremely useful in the adoption of new onboard systems and weapons.

The navy also uses specialized teams for certain missions that ship crews cannot perform to the necessary level due to the extreme amount of training required to complete these specific missions. These teams include acoustic intelligence teams, intelligence gathering teams, and scientific teams. In the future, it may be desirable to build sensor or weapon specific teams that could embark on a ship or submarine to operate new and complex equipment. If future systems begin to be introduced very rapidly, the time required to train a ship's crew to the level of proficiency necessary to properly employ these systems may be too great. The use of these specialized teams would allow for the rapid integration of new technologies into the fleet and provide on-the-job training from experts to the crews at the same time.

Conclusion

The U.S. submarine force is highly capable of conducting self-assessments. It prides itself on its ability to find problems, determine root causes and corrective actions that correct the problems. This process needs to be applied to the force as a whole. There are significant threats

¹⁷ John, M. Richardson, A Design for Maintaining Maritime Superiority, Naval War College Review 69, no. 2 (Spring, 2016): 11-18, <https://search.proquest.com/docview/1786538439?accountid=322>

to the future of the submarine force from adversaries that have studied our tactics, weapons, platforms and are preparing to exploit our weaknesses.

The submarine force must aggressively seek out ways to improve our warfighting capabilities. As the CNO states, we must “Understand the lessons of history so as not to relearn them.”¹⁸ History has shown that a powerful navy that does not evolve its strategies and doctrine will be in danger of being defeated by rising powers that seek to overthrow the reigning power.

The strategic direction needs to provide a clear and concise vision of the problems facing our force and direction on how they will be fixed. The navy must also coordinate to develop a whole of navy DMO concept to align all domains in a more offensive oriented fashion. This realignment must place a renewed emphasis on warfighting and ensure that leadership understands what that means. The operational level must develop new and effective C2 structures for the DMO strategy and fully embrace the use of mission command. At the ship level, the COs should concentrate on building an effective warfighting team from the deck-plate up. Reassess the way we train and ensure that our training is results based, not process based.

The development and rapid implementation of new technologies and weapons is also vital to maintaining our position as the preeminent sea power in the world. Other nations are rapidly closing the technological gap. Our processes must be improved to ensure that our advantage is maintained.

This is not a declaration that the proverbial sky is falling. The threats are real. The risk is real. If action is not taken to change the course for the future of the submarine force and the USW community, we will risk no longer being capable of achieving dominance of the undersea domain.

¹⁸ John, M. Richardson, A Design for Maintaining Maritime Superiority, Naval War College Review 69, no. 2 (Spring, 2016): 11-18, <https://search.proquest.com/docview/1786538439?accountid=322>

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